

WHAT IS CLAIMED IS:

1. An apparatus for unloading a substance from a tube, said apparatus comprising:

a first support assembly for supporting a plurality of tubes, each of said tubes having an axial passage, a first open end and a second open end, said first end of said tube being coupled to said first support;

a second support spaced from said first support;

a plurality of plungers having a first end coupled to said second support and a second end axially aligned with an axial passage of a respective tube; and

a drive assembly for moving said first support along a linear path toward said second support, whereby said tubes slide onto said respective plunger to unload said substance from said second end of said tubes.

2. The apparatus of claim 1, further comprising a base, wherein said first support is movable along said linear path with respect to said base and wherein said second support is substantially immovable with respect to said base.

3. The apparatus of claim 2, further comprising at least one guide rail extending between said first support and said second support, wherein said first support is movable along said guide rail.

4. The apparatus of claim 3, wherein said first support comprises a carriage operatively connected to said guide rail.

5. The apparatus of claim 4, wherein said carriage includes a bore receiving said guide rail, said carriage being slidable on said guide rail.

6. The apparatus of claim 2, wherein said drive assembly comprises:

a threaded shaft oriented along said linear path, and
a coupling member attached to said first support, said coupling member having a bore with internal threads coupled to said threaded shaft; and

a motor coupled to said threaded shaft for rotating said shaft to move said first support along said linear path toward said second support.

7. The apparatus of claim 6, wherein said motor is a reversible direction motor.

8. The apparatus of claim 1, wherein said first support assembly comprises a mounting plate having a first side, a second side and a plurality of spaced-apart openings extending between said first side and said second side, and where said second end of said plungers are received in a respective opening in said mounting plate.

9. The apparatus of claim 8, wherein said first support assembly further comprises:

a rack for supporting said tubes, said rack having a top wall with a plurality of openings for receiving said first end of said tubes, said rack being coupled to said coupling plate with said

opening of said top wall of said rack aligned with a respective opening of said coupling plate.

10. The apparatus of claim 1, wherein said plungers having an outer dimension complementing said axial passage of said tubes.

11. The apparatus of claim 1, further comprising a plunger member received in said first end of said tubes between said substance in said tubes and said second end of said plungers.

12. The apparatus of claim 11, wherein said plunger member is made of a flexible material and has an external dimension complementing said axial passage of said tubes.

13. The apparatus of claim 12, wherein said plunger member is a substantially spherical shaped member.

14. The apparatus of claim 12, wherein said plunger member is a silicone rubber ball.

15. The apparatus of claim 1, wherein said plungers are oriented at an incline with respect to said linear path.

16. The apparatus of claim 15, wherein said second support maintains said plungers at said incline through movement of said first support along said linear path.

17. The apparatus of claim 15, wherein said second support comprises:

a support bar having a first end and a second end, said first end of said plungers being coupled to said support bar;

a first bracket coupled to said first end of said support bar; and

a second bracket coupled to said second end of said support bar.

18. The apparatus of claim 17, further comprising at least one guide member having a first end coupled to said first support and a second end coupled to said second support and extending substantially parallel to said plungers.

19. The apparatus of claim 18, wherein said first end of said at least one guide member is fixed to said first support and said second end of said guide member is slidably coupled to said support bar.

20. The apparatus of claim 18, comprising two spaced apart guide members.

21. The apparatus of claim 19, wherein said guide member is a rod and said support bar includes an opening extending therethrough and having an internal dimension complementing said rod to allow said rod to slide through said opening.

22. The apparatus of claim 19, wherein said first and second brackets have an elongated slot and said ends of said support bar are received in said slot of a respective bracket, wherein said ends of said

support bar slide within said slots as said first support moves along said linear path.

23. The apparatus of claim 22, further comprising a bearing member coupled to each end of said support bar, and said bearing members being received in a respective slot of said first and second braces.

24. An apparatus for unloading a substance from a tube onto a surface, said apparatus comprising:

- a first support having a first side and a second side with at least one aperture extending between said first side and said second side, and having a movable carriage;

- a tube support member for supporting at least one tube containing said substance, said tube support member being coupled to said first side of said first support so that said tube is aligned with said at least one aperture;

- a second support spaced from said first support;

- at least one plunger rod having a first end coupled to said second support and a second end received in said at least one aperture of said first support; and

- a drive assembly for moving said carriage, in a linear path toward said second support whereby said plunger rod passes through said tube to unload said substance onto a surface.

25. The apparatus of claim 24, further comprising a base and at least one guide rail, wherein said carriage is slidably mounted on said guide rail and is movable along said linear path with respect to

said base and wherein said second support is substantially immovably mounted with respect to said base.

26. The apparatus of claim 25, wherein said carriage includes a bore receiving said guide rail, whereby said carriage is slidable on said guide rail.

27. The apparatus of claim 24, wherein said drive assembly comprises:

- a threaded shaft oriented along said linear path;
- a coupling member attached to said carriage, said coupling member having a bore with internal threads coupled to said threaded shaft; and

- a motor coupled to said threaded shaft for rotating said shaft to move said carriage along said linear path toward said second support.

28. The apparatus of claim 24, wherein said first support member comprises a mounting plate and a plurality of said openings spaced apart in a row extending between said first side and said second side, and where said second end of said plunger rods are received in a respective opening in said mounting plate.

29. The apparatus of claim 28, wherein said tube support member comprises:

- a rack for supporting said tubes, said rack having a top wall with a plurality of openings for receiving said first end of said tubes, said rack being coupled to said mounting plate with said

opening of said top wall of said rack aligned with a respective opening of said mounting plate.

30. The apparatus of claim 24, further comprising a plunger member received in said first end of said tubes between said substances and said second end of said plunger rods.

31. The apparatus of claim 30, wherein said plunger member is a substantially spherical shaped member.

32. The apparatus of claim 30, wherein said plunger member is a silicone rubber ball, said plunger rods are oriented at an incline with respect to said linear path, and wherein said second support maintains said plunger rods at said incline throughout movement of said carriage along said linear path.

33. The apparatus of claim 32, wherein said second support comprises:

a support bar having a first end and a second end, said first end of said plunger rods being fixed to said support bar;

a first bracket coupled to said first end of said support bar; and

a second bracket coupled to said second end of said support bar.

34. The apparatus of claim 33, further comprising a guide member having a first end coupled to said carriage and a second end coupled to said second support and extending substantially parallel to said plunger rods.

35. The apparatus of claim 34, wherein said first end of said guide member is fixed to said carriage and said second end of said guide member is slidably coupled to said support bar.

36. The apparatus of claim 35, wherein said guide member is a rod and said support bar includes an opening extending therethrough and having an internal dimension complementing said rod.

37. The apparatus of claim 35, wherein first and second brackets have an elongated slot and said ends of said support bar are received in said slot of a respective bracket wherein said ends of said support bar slide within said slots as said carriage moves along said linear path.

38. The apparatus of claim 37, further comprising a bearing member coupled to each end of said support bar, and said bearing members being received in a respective slot of said brackets.

39. An apparatus for unloading an electrophoresis gel from an electrophoresis gel tube onto a gel slab, said apparatus comprising:

a first support having a first side and a second side with a plurality of apertures extending through said first support between said first side and said second side and having a movable carriage;

a gel tube member having a plurality of electrophoresis gel tubes containing said electrophoresis gel, said gel tubes having a first end coupled to said gel tube support member and a second end spaced from said first support member, said gel tube support member

being coupled to said first side of said first support so that said tubes are aligned with a respective aperture;

a second support spaced from said first support;

a plurality of plunger rods having a first end coupled to said second support and a second end received in said at least one aperture of said first support;

a plurality of vertically oriented gel slabs having a top edge aligned with a respective gel tube; and

a drive assembly for moving said carriage toward said second support whereby said plunger rod passes through said tube to unload said electrophoresis gel onto said top edge of said gel slabs.

40. The apparatus of claim 39, further comprising a base and a guide rail coupled to said base, wherein a carriage is slidably mounted on said guide rail along said linear path with respect to said base and wherein said second support is immovable with respect to said base.

41. The apparatus of claim 40, wherein said drive assembly comprises:

a threaded shaft oriented along said linear path, and

a coupling member attached to said first support, said coupling member having a bore with internal threads coupled to said threaded shaft; and

a motor coupled to said threaded shaft for rotating said shaft to move said carriage along said linear path toward said second support.

42. The apparatus of claim 39, wherein said first support member comprises a mounting plate having a first side, a second side and a plurality of spaced-apart openings extending between said first side and said second side, and where said second end of said plunger rods are received in a respective opening in said first support member.

43. The apparatus of claim 42, wherein said gel tube support member comprises:

a rack for supporting said tubes, said gel tube having a top wall with said plurality of openings for receiving said first end of said tubes, said rack being coupled to said mounting plate with said opening of said top wall of said rack aligned with a respective opening of said mounting plate.

44. The apparatus of claim 39, further comprising a plunger member received in said first end of said tubes between said gel in said tubes and said second end of said plunger rods.

45. The apparatus of claim 44, wherein said plunger member is a substantially spherical shaped member made from a resilient cone rubber material.

46. The apparatus of claim 39, wherein said second support comprises:

a support bar having a first end and a second end, said first end of said plunger rods being fixed to said support bar;

a first bracket coupled to said first end of said support bar; and

a second bracket coupled to said second end of said support bar, said support bar being movable with respect to said first and second brackets upon movement of said carriage along said linear path to maintain said tubes at a substantially constant angle with respect to said gel slabs.

47. The apparatus of claim 46, further comprising two spaced apart guide members having a first end coupled to said carriage and a second end slidably coupled to said support bar and extending substantially parallel to said plunger rods.

48. The apparatus of claim 47, wherein said guide members comprises a rod, and said support bar includes two spaced apart openings, and said rods extend through a respective opening in said support bar.

49. The apparatus of claim 47, wherein first and second brackets have an elongated slot and said ends of said arm include a bearing member received in said slot of a respective brace wherein said bearing members of said arm slide within said slots as said first support moves along said linear path.

50. An apparatus for unloading a gel from an isoelectric focusing gel tube, said apparatus comprising:

a housing having a first end, a second end opposite said first end and a side wall, said housing having an axial passage extending between said first and second ends, said axial passage having a first open end at said first end of said housing and a second open end at said second end of said housing;

a plunger rod having a first end positioned in said first open end of said axial passage of said housing;

a gel tube having an axial bore containing an isoelectric focusing gel, said gel tube having a first open axial end and a second open axial end, said first open axial end of said gel tube being positioned in said second open end of said axial passage; and

a resilient plunger member positioned between said first end of said plunger rod and said gel within said gel tube, said resilient plunger member having an outer dimension to fit within said bore of said gel tube.

51. The apparatus of claim 50, wherein said plunger member is a resilient rubber ball having an outer dimension slightly greater than an inner dimension of said gel tube.

52. The apparatus of claim 50, wherein said plunger rod has a substantially cylindrical shape and an outer dimension to slide within said gel tube.

53. The apparatus of claim 52, wherein said plunger rod includes an actuator member coupled to said second end thereof.

54. A method of unloading an isoelectric focusing gel from a gel tube, said method comprising:

providing a gel tube having an axial bore containing an isoelectric focusing gel, said gel tube having a first open axial end and a second open axial end;

coupling said first end of said gel tube to a first end of an unloading assembly, said unloading assembly having a flexible

plunger member aligned with said first open axial end of said gel tube and a reciprocating plunger rod aligned with said plunger member and said first open axial end of said gel tube; and

moving said plunger rod against said plunger member and forcing said plunger member and said first end of said plunger rod through said axial passage of said gel tube to unload said gel.

55. The method of claim 54, wherein said plunger rod is a substantially rigid rod having a substantially cylindrical shape.

56. The method of claim 55, wherein said plunger rod includes an actuator member coupled to said second end thereof, and wherein said method comprises actuating said actuator member to unload said gel.

57. The method of claim 54, wherein said plunger member is a substantially spherical silicone rubber member having an outer dimension greater than an inner diameter of said gel tube so as to deform as said plunger member passes through said gel tube.

58. The method of claim 54, further comprising providing a drive assembly coupled to said plunger rod, and

actuating said drive assembly to move said plunger rod and plunger member through said gel tube.

59. The method of claim 58, further comprising providing a plurality of said gel tubes and a plurality of said plunger members and plunger rods, each of said plunger members and plunger rods being

aligned with a respective gel tube, and where each of said plunger rods are coupled to said drive assembly for simultaneously moving said plunger rods and plunger members through said gel tubes.